GENERAL MONITORS

Model IR5500

Infrared Open Path Gas Detector
HART Field Device
Specification

ISO 9001
TOTAL CUSTOMER SATISFACTION

Instruction Manual **10-10**

MANIR5500H

Part No. **MANIR5500H**
Revision **A/10-10**

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Table of Contents

Table of Tables

1.0 Introduction

1.1 Scope

The IR5500 Monitor System detector complies with HART Protocol Revision 6.0. This document specifies all of the device specific features and documents HART Protocol implementation details. The functionality of this Field Device is described sufficiently to allow its proper application in a process and its complete support in HART capable Host Applications.

1.2 Purpose

This specification is designed to complement the IR5500 Instruction Manual by providing a complete description of this field device from a HART Communications perspective. This specification is designed to be a technical reference for HART capable host application developers, system integrators, and knowledgeable end users.

1.3 References

DOCUMENT NAME	DOCUMENT RELATIONSHIP
HART Communications Protocol Specifications	This is used to insure compliance with the HART Communication Protocol.
IR5500 Instruction Manual	This is the General Monitors, Inc. IR5500 Product Instruction Manual.

2.0 Device Identification

The following Table 1 is the Field Device Identification Data for the instrument.

Table 1: Field Device Identification Data

Manufacturer's Name	General Monitors, Inc.	Model Number	IR5500
HART ID Code	223 (DF Hex)	Device Type Code:	135 (87 Hex)
HART Protocol Revision	6.0	Device Revision:	1
Number of Device Variables	0		
Physical Layers Supported	1		
Physical Device Category	FSK		

3.0 Product Overview

The Model IR5500 Infrared Open Path System is a microprocessor-based hydrocarbon gas detector (Figure 13). The system consists of an IR Source unit and a Receiver unit that may be placed from 5-150 meters apart. The General Monitors Model IR5500 is calibrated at the factory and needs no further calibration. The sensitivity of the Model IR5500 can be checked by placing a Test Gas Filter in front of the Receiver unit. It is also relatively maintenance free, requiring only a periodic cleaning of the windows to assure dependable performance. The Model IR5500 Infrared Open Path System

continuously monitors hydrocarbon gases in both the 0 to 5000 ppm•meter and 0 to 5 LEL•meter range for methane. It provides two 4 to 20 mA analog signals proportional to each of the above ranges, in addition to a digital display and an A3 (LEL•meters-Alarm), A2 (LEL•meters-Warn), A1 (ppm•meters-Warn) and FAULT relay contacts.

4.0 Product Interfaces

4.1 Process Interface

This section describes all interfaces between the devices and the measured process.

4.1.1 Sensor Input Channels

4.2 Host Interface

The HART interface uses the 4 – 20 mA current loop. Refer to the Installation Manual for connection details.

4.2.1 Analog Output: Lower Explosive Limit Meter (LEL.m)

The primary variable is proportional to the lower explosive limit meter. A 4.0 mA output current corresponds to zero LEL.m. 20.0 mA output current corresponds to 100 of full scale.

4.3 Local Interfaces, Jumpers, and Switches

Refer to the Installation Manual for connection details.

4.3.1 Local Controls and Displays

Local controls and displays are described in the IR5500 User Manual

4.3.2 Internal Jumpers and Switches

There are no internal jumpers or switches in the IR5500 unit.

5.0 Device Variables

There are no device variables exposed to the user.

6.0 Dynamic Variables

There are there Dynamic Variables exposed to the user.

6.1 Primary Variable = Lower Explosive Limit Meter (LEL.m)

The primary variable is proportional to the lower explosive limit. A 4.0 mA output current corresponds to zero LEL. 20.0 mA output current corresponds to 100% of full scale.

6.2 Secondary Variable = Gas Reading in Part per Million Meter (ppm.m)

Detected gas in ppm.m.

6.3 Tertiary and Quaternary Variables = Analog Output (mA)

The secondary variable is proportional to the part per million meter. A 4.0 mA output current corresponds to zero ppm.m. 20.0 mA output current corresponds to 100 of full scale.

6.4 Quaternary Variables: Not Applicable

There are none defined for the IR5500 product.

7.0 Status Information

The priority error, which is returned via bytes 0 and 1 of Common Practice Command #48, is shown in Table 2.

Table 2: Error Status Information

Byte	Bit	Description	Class	Device Status Bits Set
LSB	0	IR Close to Low	Error	4,7
	1	Dirty Lens	Error	4,7
	2	IR is Low	Error	4,7
	3	IR is High	Error	4,7
	4	Wire Shorted	Error	4,7
	5	Low Line Voltage	Error	4,7
	6	Failed to Calibrate	Error	4,7
	7	Failed to Zero	Error	4,7
MSB	0	Gas Check Timeout	Error	4,7
	1	Over Temperature	Error	4,7
	2	XMTR Fault	Error	4,7
	3	Heater Fault	Error	4,7
	4	Setup Menu Fault	Error	4,7
	5	Misc. Fault	Error	4,7
	6	Excess Negative Drift	Error	4,7
	7	NVM Checksum Error	Error	4,7

These bits may be set at power up to indicate an instrument failure. They may also be set by a failure detected during continuous background diagnostic testing.

8.0 Universal Commands

Command 3 returns the current loop variable, the primary variable, the secondary variable and the tertiary variable for a total of 19 bytes returned. Command 9 returns the PV, the SV and TV.

9.0 Common Practice Commands

The following common practice commands are implemented.

9.1 Supported Commands

The following common-practice commands shown in Table 3 are implemented:

Command Number	Byte Number	Meaning
Command 38	N/A	Reset Configuration Changed Flag.
Command 48	0	Returns Priority Error Status, High Byte (See Fault table 3).
Command 48	1	Returns Priority Error Status, Low Byte (See Fault table 3).
Command 48	2	Returns Error Status High Byte (See Fault table 3).
Command 48	3	Returns Error Status Low Byte (See Fault table 3).
Command 48	4	Returns Power Cycled Flag
Command 48	5	Returns Event Happened Flag
Command 48	6	Value = 0: All OK; Bit 0: Maintenance Required; Bit 1: Fault
Command 48	7	Returns 0

Table 3: IR5500 – Supported Common Practice Commands

9.2 Burst Mode

The IR5500 does not support Burst Mode.

9.3 Catch Device Variable

This Field Device does not support Catch Device Variable.

10.0 Device Specific Commands

The Device Specific commands are used strictly for the unique features of the IR5500 and at the discretion of General Monitors. They are described here in section 10.0 and are summarized in Table 4

Command #131: Do Abort

This sends a command to set active head to run mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 5		Undefined
6	Error	Device Specific Command
7 - 127		Undefined

Command #136: Set Alarm LEL.m Hi Level

This sets the Alarm Hi level for LEL.m

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Hi level, % of FS

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Hi level, % of FS

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2	N/A	Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received

Code	Class	Description
6 – 127	N/A	Undefined

Command #137: Set Alarm LEL.m Lo (Warn) Level

This sets the Alarm Lo (Warn) level for LEL.m

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Lo (warn) level, % of FS

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm Lo (warn) level, % of FS

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2	N/A	Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small
5	Error	Too Few Data Bytes Received
6 – 127	N/A	Undefined

Command #138: Set Alarm ppm.meter Level

This command set Alarm ppm.m level
Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm ppm.m level

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm ppm.m level

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2	N/A	Undefined
3	Error	Passed Parameter Too Large
4	Error	Passed Parameter Too Small

Code	Class	Description
5	Error	Too Few Data Bytes Received
6 – 127	N/A	Undefined

Command #139: Reset Alarms

This resets latching alarms.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
None	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 127		Undefined

Command #141: Set Relay (Alarm) Configuration

This sets relay or alarm configuration.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm LEL Hi Relay La/nL: 0 – nL, 1 - LA
1	Unsigned-8	Alarm LEL Hi Relay En/dE: 0 – dE, 1 - En
2	Unsigned-8	Alarm LEL Lo Relay La/nL: 0 – nL, 1 - LA
3	Unsigned-8	Alarm LEL Lo Relay En/dE: 0 – dE, 1 - En
4	Unsigned-8	Alarm ppm Relay La/nL: 0 – nL, 1 - LA
5	Unsigned-8	Alarm ppm Relay En/dE: 0 – dE, 1 - En

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Alarm LEL Hi Relay La/nL: 0 – nL, 1 - LA
1	Unsigned-8	Alarm LEL Hi Relay En/dE: 0 – dE, 1 - En
2	Unsigned-8	Alarm LEL Lo Relay La/nL: 0 – nL, 1 - LA
3	Unsigned-8	Alarm LEL Lo Relay En/dE: 0 – dE, 1 - En

4	Unsigned-8	Alarm ppm Relay La/nL: 0 – nL, 1 - LA
5	Unsigned-8	Alarm ppm Relay En/dE: 0 – dE, 1 - En

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #142: Reset Event Happened flag

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
None	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #143: Read Event Logging Counters

Reads the 5 event logging counters.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	Unsigned-16	Warning Event Counter
2 - 3	Unsigned-16	Alarm Event Counter

4 - 5	Unsigned-16	Fault Event Counter
6 - 7	Unsigned-16	Maintenance Event Counter
8 - 9	Unsigned-16	Calibrate Event Counter

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #144: Clear Event Logging Counters

This resets the 5 event logging counters in the active head to zero.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
None	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #145: Read Warning Event Log

This reads Warning Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute

9	Unsigned-8	Event Second
10,11	Unsigned- 16	N/A (Head Number)
12,13	Unisigned-16	Warning Code: 0 -LEL Warn, 1 - ppm Warn

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #146: Read Alarm Event Log

This reads Alarm Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10,11	Unsigned- 16	0
12,13	Unisigned-8	Reserved = 0

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #147: Read Fault Event Log

This reads Fault Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-11	Unsigned-16	0
12-13	Unsigned-16	Event Cause – See device specific table

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #148: Read Maintenance Event Log

This reads Maintenance Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Event Log Number
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-11	Unsigned-16	0
12-13	Unsigned-16	Maintenance Code: 0 – Gas Check, 3 - Alignment

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #149: Set Clock

This sets the internal real-time clock.

Request Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Response Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #150: Read Clock

This reads the internal real-time clock setting.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 – 2	Date	Date: Day, Month, Year-1900
3	Unsigned-8	Hours
4	Unsigned-8	Minutes
5	Unsigned-8	Seconds

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #151: Set Run Time Meter

This sets the internal run time meter.

Request Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #152: Read Run Time Meter

This reads the internal run time meter.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 3	Unsigned-32	Run Time Meter Value

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #154: Set Event Index

This sets the index of logged event to read. 0 – latest event

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Sets index of logged event to read using commands 143 – 146. Range 0 – 9.

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Event Index

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #155: Read Event Index

This reads event logged index.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned - 8	Event index

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #156: Read Calibration Event Log

This reads Maintenance Event Log as specified by the event log number. Event 0 is the most recent event. Event 1 is the one just before that and so forth.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Event Log Number
0 - 3	Unsigned-32	Event Running Time (in Seconds)
4– 6	Date	Event Date: Day, Month, Year – 1900
7	Unsigned-8	Event Hour
8	Unsigned-8	Event Minute
9	Unsigned-8	Event Second
10-11	Unsigned-16	N/A
12-13	Unsigned-16	Calibrate Code: 1 – Zero, 2 – Cal LEL, 3 – Cal ppm

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #163: Read Fast Changing Information

This reads the fast changing information from the active head.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	Unsigned-16	Mode
2 - 3	Unsigned-16	Sub Mode
4 – 7	Float	Primary Analog Output (reflect to % LEL.m level)
8 – 9	Unsigned-16	Priority fault
10 – 11	Bit map	Error status
12	Unsigned-8	Alarm status : 0 – off, 1 – on

13	Unsigned-8	Warn status : 0 – off, 1 – on
14	Unsigned-8	Alarm ppm status : 0 – off, 1 – on
15	Unsigned-8	Power cycled flag
16	Unsigned-8	Event happened flag
17-20	Integer-8	% of FS
21-24	Integer-32	ppm level
25	Unsigned-8	Reserved = 0
26-29	Float	Secondary Analog Output (reflect to ppm.m)
30-31	Unsigned -16	AJ Number

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #164: Read Slow Changing Information

Request slow changing information from the active head.

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0 - 1	signed-16	Temperature
2 - 5	float	Voltage
6 - 7	signed-16	% blockage or gain

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #165: Read Setup Information

Request setup information from the active head.

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Gas ID 100: Methane NFPA 101: Propane NFPA 114: Methane IEC 115: Propane IEC
1	Enumerated	Measured Units – 240 Factory defined for LEL.m
2 - 5	Unsigned-32	Full Scale
6	Unsigned-8	Alarm LEL.m level, % of FS
7	Unsigned-8	Alarm LEL.m Relay La/nL: 0 – nL, 1 - LA
8	Unsigned-8	Alarm LEL.m Relay En/dE: 0 – dE, 1 - En
9	Unsigned-8	Alarm Warn LEL.m level, % of FS
10	Unsigned-8	Alarm Warn LEL.m Relay La/nL: 0 – nL, 1 - LA
11	Unsigned-8	Alarm Warn LEL.m Relay En/dE: 0 – dE, 1 - En
12	Unsigned-8	Warn ppm.m level, % of FS
13	Unsigned-8	Warn ppm.m Relay La/nL: 0 – nL, 1 - LA
14	Unsigned-8	Warn ppm.m Relay En/dE: 0 – dE, 1 - En
15	Unsigned-8	Beam Block Delay Time
16	Unsigned-8	AO Beam Block Delay Time
17	Unsigned-8	Reserved = 0
18-19	Unsigned-16	Reserved = 0
20	Unsigned-8	0
21	Unsigned-8	0
22	Unsigned-8	Calibration Level = 50
23	Unsigned-8	0
24	Unsigned-8	Current Range – 0: 3.5mA – 20mA ; 1: 1.25mA – 20mA

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #166: Read System Firmware Rev

This command read the system firmware revision

Request Data Bytes

Byte	Format	Description
None	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	System Firmware Revision. ASCII code

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1-127		Undefined

Command #167: Set Beam Block Delay

This sets the beam block delay time from 0 – 60 minutes.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	Beam block delay time

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	Beam block delay time

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #168: Set Analog Output Beam Block Delay

This sets the current beam block delay time from 0 – 60 seconds.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	AO beam block delay time

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	AO beam block delay time

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #170: Set Current Range

This sets the current range to be either one of 2 possible selections.

Request Data Bytes

Byte	Format	Description
0	Unsigned-8	0 – Range 3.5mA - 20mA, 1 -- Range 1.25 - 20mA

Response Data Bytes

Byte	Format	Description
0	Unsigned-8	0 – Range 3.5mA - 20mA, 1 -- Range 1.25 - 20mA

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Passed Parameter Too Large
4		Undefined
5	Error	Too Few Data Bytes Received
6 - 127		Undefined

Command #191: End Alignment

This sends a request to the end alignment.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 5		Undefined
6	Error	Device Specific Command Error
5 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #195: Do Gas Check

This sends a request to the active unit to put the unit to Gas Check mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 - 2		Undefined
3	Error	Parameter too Large
4	Error	Parameter too Small
5 - 15		Undefined
16	Error	Access Restricted
17 - 127		Undefined

Command #197: Do Align

This sends a request to the active unit to put the unit to Align mode.

Request Data Bytes

Byte	Format	Description
0	N/A	N/A

Response Data Bytes

Byte	Format	Description
0	N/A	N/A

Command-Specific Response Codes

Code	Class	Description
0	Success	No Command-Specific Errors
1 – 2		Undefined
3	Error	Parameter too Large
4	Error	Parameter too Small
5 – 15		Undefined
16	Error	Access Restricted
17 – 127		Undefined

11.0 Tables

11.1 IR5500 – Device Specific Commands Summary

The following Table 4 is a summary of the IR5500 Device Specific Commands. The Reg values in the Meaning Column denote the corresponding Modbus Register.

Table 4: IR5500 – Device Specific Commands

Command Number	Byte Number	Meaning
131		Do Abort
136		Set Alarm LEL.m Hi Level
137		Set Alarm LEL.m Lo (Warn) Level
138		Set Alarm ppm.m Level
139		Reset Alarms
141		Set Relay (Alarm) Configuration
142		Reset Event Happening Flag
143		Read Event Logging Counters
144		Clear Event Logging Counters
145		Read Warning Event Log
146		Read Alarm Event Log
147		Read Fault Event Log
148		Read Maintenance Log
149		Set Clock
150		Read Clock
151		Set Run Time Meter
152		Read Run Time Meter
154		Set Event Index
155		Read Event Index
156		Read Calibration Event
163		Read Fast Changing Information
164		Read Slow Changing Information
165		Read Setup Information
166		Read System FW Rev.
167		Set Beam Block Delay Time
168		Set AO Beam Block Delay Time
170		Set Current (AO) Range
191		End Align
195		Do Gas Check
196		Do Align

11.2 IR5500 – Operating Mode - PV Values

The following Table 5 is a summary of the IR5500 Operating Mode Values:

Operating Mode	Value in Decimal
RUNNING	1
CALIBRATION	2
ZEROING	4
CAL IN PROCESS	8

Operating Mode	Value in Decimal
APPLY GAS	16
REMOVE GAS	32
STARTUP	64
TEMPERATURE CORRECTION	128
ALIGN MODE	256
GAS CHECK	512
ZERO / CAL	1024

Table 5: IR5500 - Operating Mode Values

Operating Sub-Mode	Value in Decimal
<blank>	0
ppm.m Warn	1
Warn	2
Warn & ppm.m Warn	3
Alarm	4
Alarm & ppm.m Warn	5
Alarm & Warn	6
Alarm, Warn & ppm.m Warn	7

Table 6: IR5500 - Operating Sub-Modes

11.3 Fault Event Log – Cause Description

The following Table 7 describes the cause as reported by the read event log commands:

Bits	Cause
0x0000	<none>
0x0001	CLOSE TO LOW IR
0x0002	DIRTY LENS
0x0004	LOW IR
0x0008	HIGH IR
0x0010	WIRE SHORTED
0x0020	LOW LINE VOLTS
0x0040	FAILED TO CALIBRATE
0x0080	FAILED TO ZERO
0x0100	GAS CHECK TIME OUT
0x0200	OVER TEMPERATURE
0x0400	XMTR FAULT
0x0800	HEATER FAILURE
0x1000	FAILED SET UP MENU
0x2000	MISC. FAULT
0x4000	EXCESS NEGATIVE DRIFT
0x8000	NVM CHECKSUM FAULT

Table 7: Fault Event Log – Cause Description Performance

11.4 Sampling Rates

The IR5500 samples each detector at 1 msec intervals.

11.5 Power-up

On power up, the IR5500 executes a self-test procedure (unit displays 'SU'), which requires approximately 2 minutes. During this time, the analog output is set to 1.25 or 3.5mA. After the self-test is satisfactorily completed, the unit sets the PV to a value representing the mode of the instrument.

11.6 Device Reset

The IR5500 cannot be reset by any command. The unit only resets when power is cycled.

11.7 Self-Test

The IR5500 goes through a self-test upon power cycle. Should any of the tests fail, the unit immediately reports a fault condition.

11.8 Command Response Delay

The IR5500 responds as follows:

Response Type	Response Time
Minimum	20ms
Typical	50ms
Maximum	100ms

Table 8: Command Response Times

11.9 Busy and Delayed-Response

The IR5500 does not use delayed-response times.

11.10 Long Messages

The largest data field used by the IR5500 is in response to Command 21: 34 bytes including the two status bytes.

11.11 Non-Volatile Memory

The IR5500 uses external NVM to hold the device's configuration parameters. New data is written to this memory immediately on execution of a write command.

11.12 Operating Modes

The IR5500 reports lower explosive limit meter (LEL.m) and part per million meter (ppm.m) detected. Various other modes are supported related to the calibration of the instrument.

11.13 Write Protection

The IR5500 does not support any write protection mode.

Annex A. Capability Checklist

Manufacturer, model, and revision	General Monitors, Inc., IR5500, Revision 1
Device type	IR Open Path Gas Detector
HART revision	6.0
Device Description available	Yes
Number and type of sensors	1
Number and type of actuators	0
Number and type of host side signals	2: 4 - 20mA analog
Number of Device Variables	0
Number of Dynamic Variables	3
Mappable Dynamic Variables?	No
Number of common-practice commands	2
Number of device-specific commands	30
Bits of additional device status	8
Alternative operating modes?	No
Burst mode?	No
Write-protection?	Mfg Only

Table 9: Capability Checklist

Annex B. Default Configuration

Parameter	Default value
Lower Range Value	N/A
Upper Range Value	N/A
PV Units	LEL.m (Percent Lower Explosive Limit meter)
Secondary Units	ppm.m (Part Per Million meter)
Tertiary Units	mA
Sensor type	IR
Number of wires	3
Damping time constant	N/A
Fault-indication jumper	N/A
Write-protect jumper	N/A
Number of response preambles	5

Table 10: Default Configuration

Annex B. DD menu diagram

